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Flood frequency estimation by continuous simulation under climate change (with uncertainty)

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Abstract. This paper explores the potential for assessing the impacts of climate change upon flood frequency for the gauged, upland Wye catchment at Plynlimon, Wales, UK, while taking account of uncertainty in modelling rainfall-runoff processes under current conditions. A continuous simulation methodology which uses a stochastic rainfall model to drive the rainfall-runoff model TOPMODEL is utilised. *Behavioural* parameter sets for both the rainfall model and TOPMODEL are identified prior to the climate change runs using the Generalised Likelihood Uncertainty Estimation (GLUE) methodology. The "medium-high" UKCIP98 climate change scenario, obtained from the HadCM2 GCM simulations, is used as a starting point for a variety of different scenarios at the catchment scale. It is demonstrated that while the scenarios have only a small impact upon the likelihood weighted flood frequency uncertainty bounds in comparison with the current condition scenario, the risk of a given discharge as an element in the distribution of *T* year floods is changed. This underlines the need to account explicitly for uncertainty within hydrological modelling, especially in estimating the impacts of climate change.

Keywords: Climate change; Floods; Frequency; TOPMODEL

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